Risk Evaluation

APHIS Evaluation of the Classical Swine Fever Status
of Baja California, Mexico

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November 2001

Introduction

In assessing the Classical Swine Fever (CSF) status of the state of Baja California (BC), Mexico, and in accordance with its regulations [1], APHIS evaluated the following factors based on information provided by the government of Mexico:

- Authority, organization and infrastructure of veterinary services;
- Disease surveillance;
- Diagnostic laboratory capabilities;
- Disease outbreak history and disease prevalence;
- Active disease control programs, if any, if the agent is known to exist in the region;
- Vaccination status;
- Disease prevalence and outbreak history in adjacent regions;
- Separation of the region from regions of higher risks through physical or other barriers;
- Control of movement of animals and animal products from the regions of higher risk;
- Livestock demographics and marketing practices; and
- Animal health policies and infrastructure for animal disease control.

A summary of the data relating to each of these factors is presented below.

Description of the disease [2, 3]

Classical Swine Fever, previously known as "Hog Cholera" is a highly contagious disease of swine caused by a virus of the togaviridae family. The incubation period is usually 3-4 days, but may range from 2-14 days. In the typical acute form, pigs present with anorexia, fever of 41degrees C or more, muscle tremors, prostration, mucopurulent ocular discharge, and multiple superficial and internal hemorrhages, resulting in a purplish discoloration of the skin. Morbidity and mortality are high. In the final stages, nervous system involvement is manifested through nervous signs, paralysis, and death, usually in 10-15 days. A chronic form exists with milder symptoms, in which mature animals occasionally recover. Chronic CSF is characterized by prolonged and intermittent anorexia, fever, alternating diarrhea and constipation, and alopecia. The atypical form, associated with low virulence virus strains, may present in piglets as Congenital Tremor, characterized by tremors in the head, neck, dorsal area, and

hindquarters. Transplacental infection with low virulence strains may result in persistently infected piglets, which are a major cause of virus dissemination to uninfected farms.

The pig is the only natural reservoir of CSF. Blood, tissues, secretions, and excretions from an infected animal contain the virus. Transmission occurs mainly through the oral route, although infection can occur through the conjunctiva, mucous membrane, skin abrasions, and inseminations. Feeding of raw or insufficiently cooked garbage containing infective pork material is a potent source of CSF virus.

Regional Risk Factors

Authority, organization and infrastructure of veterinary services [4]

A decree published in the Federal Official Daily of March 25, 1980 in Mexico established the National Campaign for the control and eradication of CSF, and its corresponding program as general, mandatory and permanent throughout the entire country, with subsequent modifications made in decrees. The Ministry of Agriculture and Water Resources (SARH) has an office in BC. The office includes the functions of animal health, livestock development and establishing grazing coefficients. Under these are: the campaigns units, registration and zoo sanitary service units, TIF plant inspectors; livestock development unit; livestock promotion unit; and livestock development center. The state is subdivided into two Rural Development Districts (DDR) with supportive technical staff coordinated by the livestock sub-delegation. A collaborative relationship exists between the pork producers association, the Federal Livestock sub-delegate Office, and the State Animal Health official from the central offices. When there are suspicious cases of CSF, samples are sent to the National Animal Health Diagnostic Center located in the State of Mexico. For international control of movement of livestock and animal byproducts there are five animal health inspection offices with official veterinary inspectors. At the airports and ports there are sanitary control points. There are six checkpoints in BC for control of overland movement all of which have official SARH staff to operate them on a 24-hour basis. Hog slaughtering and processing is done in Federal Inspection Standard (TIF) establishments which comply with international sanitary requirements and have official veterinary sanitary officers and supervision and certification by the countries to which they export.

Disease surveillance [4]

Baja California maintains an active surveillance system, which includes reporting all suspected cases and sampling from community abattoirs, TIF plants, and commercial and backyard farms. Animal tracebacks from TIF abattoirs are done when necessary. Each abattoir has an official veterinarian responsible for ante and post mortem inspections. Each lot of animals is placed in a pen, with a slaughter program applied pen by pen. If an abnormality is detected during inspection, the lot to which the animal belongs can be determined and the farm of origin identified. The entry of live hogs from control zones into free zones is not allowed. Since 1993, a campaign against pseudorabies has been conducted in Mexico for which epidemiological surveys are done. Advantage is taken of these samples to run CSF tests simultaneously, thus providing additional surveillance to

that done exclusively for CSF.

Annual surveillance for CSF-free status is required under Nom-037-Z00 1995, National CSF Campaign norms [2]. In 1994, 483 sera were collected from municipal and TIF slaughterhouses [5]. Surveillance levels for 1994 to 1997 are not reported. In response to APHIS concerns regarding sampling methods and reporting, in 1997 Mexico changed its sampling protocol and initiated an on-farm surveillance system in all free states. CPA and SAGAR are providing sampling frames for backyard herds as well as commercial herds. Annual monitoring of all commercial herds is required. The norm given for 1997 is that pigs are selected from each unit that is separately managed and from unrelated herds. Generally, assuming a farrow-to-finish operation, 80 % of the samples should be from sows, 10 % from boars, and 10 % from feeders over four months of age. Backyard testing guidelines are provided for selected municipalities. The designated sites are selected randomly by the assigned veterinarian. To confirm the absence of CSF virus from Baja California, ongoing epidemiological surveys are carried out. Since 1997, at least 2,072 samples have been tested annually, with all samples negative for CSF [6].

CSF surveillance data for BC was analyzed to determine the most likely true prevalence of disease over the multiple years of testing data. For commercial herds, a hypergeometric probability function was used. For backyard herds, a binomial probability function was used. (See attachment 1 for details of this analysis). In both commercial and backyard herds, the most likely estimated prevalence is 0 for every year. In commercial swine, the probability of missing a positive animal if the true CSF prevalence is .1% (1 infection per 1,000 animals), given that no animals tested positive on surveillance during annual testing from 1997-1999, is 1.66×10^{-2}. The probability that CSF prevalence could be as high as 1% (1 infection per 100 animals) and still escape detection on annual surveillance, is vanishingly small at 3.95×10^{-25}. For backyard herds, analysis indicates that the probability of detecting no positive animals on annual surveys if the true prevalence was .1% (i.e., the probability of missing a truly positive animal) is 2.79×10^{-20}. Therefore, if CSF was present at very low levels, or was recently introduced into backyard herds, the likelihood of detecting infection on annual surveillance is virtually guaranteed.

Diagnostic Laboratory Capability [4]

Laboratories for CSF diagnosis in Mexico include the National Center for Animal Health Diagnosis (CENASA), the laboratory of the Mexican-American Commission for the Prevention of Foot-and-mouth Disease and other Exotic Animal Diseases (CPA), and eight laboratories accredited for the diagnosis of CSF located throughout the country. All test positive samples are sent to the central laboratories in Mexico City for confirmation and tissues from any suspect animal to the CPA laboratory in Mexico City for virus isolation. Both CENASA and CPA use the same tests and testing schemes.

Disease Status [4]

The last outbreak of CSF was in March 1985 in the municipality of Tiajuana. The eradication phase began in 1986 and the state was declared free of CSF by Mexico in October 1991.

Disease Control Program [2]

In accordance with the National Eradication Program, Baja California has an active disease surveillance program, strict border controls for animal movement and an emergency response team.

Vaccination Status [4]

Vaccination against CSF has not been permitted since 1986 in Baja California.

Disease status of adjacent regions [4]

Baja California is located in northwestern Mexico. Baja California is part of a peninsula; the west part of the state is bordered by the Pacific Ocean and to the east by the Gulf of California, to the south is Baja California Sur. BC has a very limited number of access points. Baja California is adjacent to Arizona, California, and Sonora. CSF is not known to occur in any of these three states.

Degree of separation from regions of higher risk [4]

BC has two natural barriers: the Gulf of California to the east and the Pacific Ocean to the west. The Colorado river forms the border between Sonora and Baja California.

Control of Animal Movement from Regions of Higher Risk [4]

Regulations controlling the movement of all land, air and maritime traffic are the primary means for preventing the reintroduction of CSF into Baja California. The entry of live hogs from CSF control zones in Mexico into free zones is not allowed. Products and byproducts from eradication or control zones to free zones must be processed and inspected by TIF establishments that are expressly authorized by the General Division of Animal Health to market their products and byproducts into CSF free and eradication zones. Transportation must be in vehicles sealed with metal straps. BC has six checkpoints for control of overland movement.

At airports, passenger baggage is examined, and, because most domestic flights originate from areas not yet declared free of CSF, food served on airplanes is not permitted to contain pork.

Pork products from regions of lower health status may be imported only if they meet time and temperature processing requirements (68.90 C for 30 minutes or 80.5^0 C for three minutes) and if they originate from an approved TIF plant. Live hogs are imported only from free states and countries.

Livestock demographics and marketing patterns [7]

In 2001, BC had 10 technified farms with a total population of 15, 251 pigs, and an additional 6, 951 head dispersed among 548 backyard operations. The presence of more

pigs in commercial farms than backyard farms is rare in Mexico. The decreasing number of pigs in backyard operations further reduces the risk of a CSF outbreak in BC. There are no markets or auctions in the state. There are three TIF plants, two of which handle swine.

BC already has one TIF plant that has been authorized to export meat to the United States since 1996, and has exported pork to Japan since 1995 without incident. BC is not self-sufficient in pork production; the pork processed at this facility originates from Sonora, the United States, and Canada.

Policies and infrastructure for animal disease control [2]

Consistent with federal policy, BC would attempt to eradicate CSF if the disease were detected. Federal animal health officials require that a local emergency response team must be established when a state enters the eradication phase of the CSF program and discontinues vaccination.

Conclusions

1) CSF has not been diagnosed in Baja California since at least 1990, despite intensive and ongoing surveillance.

2) No vaccination has occurred since 1986.

3) BC maintains a surveillance system capable of rapidly detecting CSF if it were reintroduced.

4) BC has the laws, policies, and infrastructure in place to detect, respond to, and eliminate any occurrence of CSF.

5) The strongest evidence that the risk of CSF in BC is negligible is the combination of years worth of surveillance data and the experience of the TIF plant already exporting pork products to Japan.

6) Given the virulent nature of the disease in this naive population, and the proven ability to detect disease if it were re-introduced, the ongoing surveillance indicates that the likelihood of CSF virus being present in the commercial swine operations of Baja California is low..

References

1) Regionalization Final Rule. 62 FR 56000-56026; Importation of Animals and Animal Products.

2) Ministry of Agriculture and Rural Development, Official Mexican Standard NOM-037-ZOO-1995, National Classical Swine Fever Campaign.

3) Hog Cholera. In Foreign Animal Diseases, United States Animal Health Association,

p. 273-282, 1998.

4) Report on Characterization of the State of Baja California for International Recognition as a Classical Swine Fever Free Zone. Subsecretaria de Ganaderia, Direccion General de Salud Animal, Mexico, June 1994.

5) Classical Swine Fever Free Zones in Mexico, Additional Information. Subsecretaria de Agricultura y Ganaderia, Direccion General de Salud Animal, August 1995.

6) Additional Information Requested for the Recognition of the States of Baja California, Baja California Sur, Sinaloa, and Chihuahua as Low Risk Regions for Classical Swine Fever, 1999.

7) Zoosanitary Information for the Recognition of Baja California as a State Free from Classical Swine Fever (CSF). Animal and Plant Health National Commission, Animal Health General Directorate, 2001.

Appendix 1

**Data Analysis of Commercial and Backyard Herds based on Annual Surveillance
Data for CSF in the State of Baja California**

Baja California Surveillance Information

CSF in BC	Year	1997	1998	1999	2000
	Total Population		18256	19523	
	Number of Herds		43	51	
	sample size	29	29	29	29
	Total Samples (Commercial)	667	1080	708	
	Presumed Prevalence=5%				
	Total Population (Back Yard)		3742	5400	
	Number of Herds (Back Yard)		172	241	
	sample size	5	5	5	5
	Total Samples (Back Yard)	1571	1545	1364	
	Presumed Prevalence=1%				
	Grand Total Samples	2238	2625	2072	0

Immunoperoxidase Test	Sensitivity	0.97
	Specificity	0.97

Hypergeometric Probability Function of Commercial Herds

Prevalence (P)	1997[a]	1998	1999	Total Prob[b]	1-Tot Prob[c]
0.10%	.285	.271	.215	1.66×10^{-2}	9.83×10^{-1}
1.00%	3.85×10^{-8}	4.01×10^{-8}	2.56×10^{-10}	3.95×10^{-25}	1.00
2.00%	1.16×10^{-28}	8.92×10^{-28}	1.0×10^{-45}	1.0×10^{-101}	1.00
5.00%	1.0×10^{-45}	1.0×10^{-45}	1.0×10^{-45}	1.0×10^{-135}	1.00
(n/N) [d]		5.92%	3.63%		

a: Probability of observing zero positive animals in that one survey year if the actual prevalence of CSF was P in the total population.
b: Probability of observing zero positive animals through all years of surveillance, given that there was an ongoing infection in the population of prevalence P.
c: Probability of observing 1 or more positive animals through all years of surveillance, given that there was an ongoing infection in the population of prevalence P; i.e., a measure of survey confidence.
d: Number of samples collected / total population in all commercial herds for that year.

Binomial Approximation to the Hypergeometric Probability Function of Backyard Herds

Prevalence (P)	1997	1998	1999	Total Prob[a]	1-Tot Prob[b]
0.10%	2.08×10^{-1}	2.13×10^{-1}	2.55×10^{-1}	1.13×10^{-2}	9.89×10^{-1}
1.00%	1.39×10^{-7}	1.8×10^{-7}	1.11×10^{-6}	2.79×10^{-20}	1.00
2.00%	1.64×10^{-14}	2.78×10^{-14}	1.08×10^{-12}	4.93×10^{-40}	1.00
5.00%	1.01×10^{-35}	3.83×10^{-35}	4.12×10^{-31}	1.59×10^{-100}	1.00
(n/N) [c]	34.37%	41.29%	25.26%		

a: Probability of detecting zero positive animals through all years of annual surveillance given that the true prevalence was P.
b: Probability of detecting 1 or more positive animals in all years of surveillance given

that the true prevalence was P.
c: sample size (n) / total population in backyard herds (N) to give percent of population tested each year during annual surveillance.